Applied Mechanics and Materials
ISSN: 1662-7482, Vol. 842, pp 83-91
doi:10.4028/www.scientific.net/AMM.842.83

Submitted: 2016-02-25
Accepted: 2016-02-25
Online: 2016-06-22

The Influence of Preheat on Distortion and Fatigue Crack Propagation Rate of FCAW Weld in A 36 Steel Structure.

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Keywords: FCAW welding, Preheat, distortion, fatigue and breakage

Abstract Welding is one of the joining processes and it has been widely used, especially for steel welded structure in off-shore, pipeline or ship construction. Advantages of the welding joint are inexpensive, process joining can be done quickly and can produce light structure compared to other joining processes. One of welding techniques mostly used for joining steel construction is flux cored arc welding (FCAW). The commonly problems arise in this welding technique are distortion and low resistance of crack propagation. The aim of this study is to minimize distortion and to increase fatigue crack growth resistance of weld joint.

In this research, FCAW welding was conducted without preheat and the other was preheated around welding area with temperature of 200 °C. Each of temperature welding process was measured using data acquisition. After completing the welding process, a sequence of experiment was conducted including chemical compositions, distortion and fatigue test. Result of this research shows that preheat temperature of 200 °C can decrease distortion and improve fatigue performance.

Introduction

Welding technique has been widely used for metal joining, in industry that produce machine and structure such as: ship industry, aircraft, automotive, piping, off-shore building and other constructions. Welding technique has important role in production process because it can decrease production cost, operational can be optimized, easy in maintenance and cheap inspection cost. This product can be challenge for welding scientists and experts in finding solution [1].

The commonly problem in plat welding for ship construction is distortion and bending in steel structure joint. Heat generated during welding can cause buckling, distortion and *residual stress*. Control on distortion and residual stress is very important, despite it needs more operation time. Buckling, distortion and residual stress tend to decrease quality and therefore more repairmen's are required expense in every ship production. More methods have been tested to measure residual stress; they performed analytically, numerically or even experimentally. The main cause or method for calculating residual stress on welding and distortion is still to be important discussion topic to find solution [2].

The most appropriate method to reduce distortion buckling and residual stress of thin plate can be conducted after welding (post-weld) or during welding (in-process welding). In-process welding includes: preheating[3], and thermal tensioning [4]. Transient thermal tensioning is technique to control residual stress and distortion by giving heat to both sides of welding area whether it is coated in the front, in the side or the back and this heat source moves together with force. The use of TTT on welding can decrease propagation rate of fatigue crack [5].

The material commonly used in panel construction of ship are A 36 or SS 400 steels. These materials are used due to their low carbon content, so that they have good weldilly. One of welding techniques mostly used for joining steel construction is flux cored arc welding (FCAW) by technique basically FCAW is similar to operating machine like *metal inert gas* (MIG) welding, but